PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

GRIFFITH HACK
GPO Box 1285K
MELBOURNE VIC 3001

GRIFFITH HACK
21 SEP 2000
1 Ltr
2 JS
3

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing *day/month/year*	19 SEP 2000
Applicant's or agent's file reference FP11796	**IMPORTANT NOTIFICATION**

International application No.	International filing date	Priority date
PCT/AU99/01079	2 December 1999	3 December 1998

Applicant
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION et al

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translations to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide

Name and mailing address of the IPEA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	PHILIPPA WYRDEMAN Telephone No. (02) 6283 2554

15

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference FP11796	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International application No. **PCT/AU99/01079**	International filing date *(day/month/year)* 2 December 1999	Priority Date *(day/month/year)* 3 December 1998

International Patent Classification (IPC) or national classification and IPC

Int. Cl. [7] C12N 15/29

Applicant

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION et al

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of **3** sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
12 May 2000	18 August 2000
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **PHILIPPA WYRDEMAN** Telephone No. (02) 6283 2554

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
[redacted]T/AU99/01079

I. Basis of the report

1. With regard to the **elements** of the international application:*

- [ ] the international application as originally filed.
- [X] the description, pages **1-61,** as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the claims, pages , as originally filed,
  Pages , as amended (together with any statement) under Article 19,
  Pages , filed with the demand,
  pages **62-64,** received on **9 august 2000** with the letter of **9 August 2000**
- [X] the drawings, pages **1/8 - 8/8,** as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the sequence listing part of the description:
  pages **1-31,** as originally filed
  pages , filed with the demand
  pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

- [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- [ ] the language of publication of the international application (under Rule 48.3(b)).
- [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

- [ ] contained in the international application in written form.
- [X] filed together with the international application in computer readable form.
- [ ] furnished subsequently to this Authority in written form.
- [ ] furnished subsequently to this Authority in computer readable form.
- [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- [ ] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [ ] the claims, Nos.
   - [ ] the drawings, sheets/fig.

5. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	**1-22**	**YES**
	Claims	**None**	**NO**
Inventive step (IS)	Claims	**1-22**	**YES**
	Claims	**None**	**NO**
Industrial applicability (IA)	Claims	**1-22**	**YES**
	Claims	**None**	**NO**

2. Citations and explanations (Rule 70.7)

None of the prior art teaches or suggests the isolated nucleic acid of the current invention.

The closest prior art is D2 (cited in the International Search Report) and discloses a MADS box gene from rice that alters the flowering time of transgenic plants in which it has been expressed. This nucleotide sequence lacks significant homology with the currently claimed sequence such that it would not hybridise to the currently claimed sequence except in the MADS box region itself which has been excluded from the claims.

The claimed material is therefore considered novel and inventive.

The claimed material is considered industrially applicable.

CLAIMS:

1. An isolated nucleic acid molecule comprising a MADS box, which is capable of altering the flowering time of a plant, and which comprises
   (a) the nucleotide sequence set out in any one of SEQ ID NOS. 1, 2, 4, and 6 to 15;
   (b) a nucleic acid molecule capable of hybridizing to a sequence set out in (a), other than to the MADS box region thereof, under at least low stringency hybridization conditions; or
   (c) a nucleic acid molecule which has at least 70% sequence identity, outside the MADS box region, with a sequence set out in (a).
2. A nucleic acid molecule according to Claim 1, in which the nucleic acid molecule is
   (a) capable of hybridizing to a nucleotide sequence as set out in any one of SEQ ID NOS: 1, 2, 4, and 6 to 15 under high stringency hybridization conditions; or
   (b) has at least 80% sequence identity with a sequence set out in Claim 1(a).
3. An isolated nucleic acid molecule according to Claim 1 or Claim 2, in which expression of the nucleic acid molecule in the plant, in the sense orientation under the control of a promoter sequence, is capable of delaying the flowering of the plant.
4. An isolated nucleic acid molecule according to Claim 1 or Claim 2, which is capable of accelerating the flowering of a plant.
5. An isolated nucleic acid molecule according to Claim 4, in which expression of the nucleic acid molecule in the plant in the anti-sense orientation under the control of a promoter sequence is capable of accelerating the flowering of the plant.
6. An isolated nucleic acid molecule according to Claim 1 or Claim 2, which comprises a nucleotide sequence

corresponding to a *FLOWERING LOCUS F* (*FLF*) gene, or a PCR primer or a biologically active fragment derived therefrom.

7. A vector comprising a nucleic acid molecule according to any one of Claims 1 to 6.

8. A plant cell transformed with a nucleic acid according to any one of Claims 1 to 6.

9. A plant transformed with a nucleic acid molecule according to any one of Claims 1 to 6.

10. A method of isolating a nucleic acid molecule capable of altering the flowering time of a target plant, comprising the step of using a nucleic acid molecule according to any one of Claims 1 to 6, or a functional portion thereof, as a hybridisation probe or polymerase chain reaction (PCR) primer, and optionally detecting hybridisation.

11. A method according to Claim 10, in which the nucleic acid molecule is capable of hybridizing to a nucleotide sequence as set out in any one of SEQ ID NOS: 1, 2, 4, and 6 to 15 under at least low stringency hybridization conditions, and the nucleic acid molecule does not include a MADS box region.

12. A method of delaying flowering in a plant, comprising the step of introducing a nucleic acid molecule according to any one of Claims 1 to 6 into cells of the plant, optionally such that expression of the nucleic acid molecule is under the control of an inducible promoter, and over-expressing the nucleic acid molecule.

13. A method of inducing early flowering in a plant, comprising the step of reducing the degree of expression of a nucleic acid molecule according to any one of Claims 1 to 6 in the plant.

14. A method of modifying the vegetative and/or floral phenotype of a plant, comprising the step of increasing the level of expression of an *FLF* gene, thereby to

modify the level of production or activity of a gibberellin in the plant.

15. A method of modifying the response of a plant to vernalisation, comprising the step of increasing or decreasing the level of expression of an *FLF* gene.

16. A method according to Claim 14 or Claim 15, in which the *FLF* gene comprises a nucleic acid molecule according to any one of Claims 1 to 6.

17. A polypeptide encoded by a nucleic acid molecule according to any one of Claim 1 to 6.

18. An *FLF* polypeptide, comprising the amino acid sequence set out in any one of SEQ ID NOS: 3,5, and 16 to 30, or having at least 70% sequence identity thereto.

19. An antibody directed against a polypeptide according to Claim 17 or Claim 18.

20. A method of assaying the level of expression of FLF polypeptide, comprising the step of using an antibody according to Claim 19.

21. A method of selecting plants with low or high levels of expression of *FLF*, comprising the step of determining the level of *FLF* mRNA or FLF polypeptide in the plant.

22. A method according to Claim 20, in which the plants are members of a naturally-occurring population.